minations of length, sex, age, and weight of over 20,000 plaice from various North Sea fishing grounds. The results show clearly that the conditions with regard to nutrition vary from ground to ground, and they suggest that a knowledge of these conditions may, in time, enable fishery authorities to increase the productivity of the North Sea by the "transplantation" of fish from grounds on which the growth is slow to other grounds on which the conditions of life are more favourable. Dr. Wallace's paper supplements that of Miss Lee in that it gives us data which cannot be obtained by ordinary methods of commercial statistics, and which are quite essential for the proper understanding of the latter.

Mr. Todd's experiments on "covered nets" are designed to elucidate the fishing action of the trawl net in respect of the numbers and sizes of fish which escape capture by the mesh employed. The outside parts of the trawl nets used have been covered by other loose nets of narrower mesh, and the fish which have escaped capture by the inner wide-meshed net are intercepted by the outer narrow-meshed net. Mr. Todd tabulates and discusses the results of a number of such experiments.

Mr. Wollaston gives an account of the first cruise made by an English vessel expressly for the purpose of determining, by means of specially constructed nets, the distribution of fish-eggs in the open sea. The cruise was made in June, 1909, in the North Sea, by the vessel *Huxley*, and tables are given which show in detail the results of the experiments made at each observation station, while synoptic charts represent the numbers and distribution of the eggs of certain species of summer-spawning fish present per square metre of sea surface in the neighbourhood of the stations. By far the most interesting part of Mr. Wollaston's paper is that devoted to a description of the methods employed. The net was specially constructed, and its "constants" were calculated so that it was possible to estimate approximately the average volume of water which was filtered through its meshes. Welcome improvements in the methods of preservation of the fish-eggs caught, so as to avoid distortion, and obscuration of finer details of structure have been developed. The author then proceeds to apply the methods of modern biometricians to the analysis of his data. It has hitherto been impossible, in work of this kind, to avoid the confusion of eggs belonging to closely allied species, since in some cases a fish-egg can only be identified by measuring its diameter, and that of the contained oil globule. In some pairs of species these pairs of characters overlap, and it was an error of this nature that vitiated (to some degree) the results of Hensen's famous North Sea cruise of 1895. Mr. Wollaston, however, elaborates a mathematical method whereby the eggs belonging to two such overlapping species can be separated. If in a number of examples of the eggs of one species two measurable variable characters, such as the diameters of the egg and oil globule, be determined, then the frequencies of these two variables can be represented by an equation, which is that of an elliptic "correlation surface." But a group of eggs may include two species allied together in that the diameters of the eggs and those of the oil globules do not differ greatly; nevertheless it is only by these characters that the eggs may be recognised. In such a case the correlation surfaces overlap. Mr. Wollaston then shows that it is always possible, by means of relatively simple mathematical methods, to decompose the compound correlation surface so obtained; and to estimate with a very fair degree of probability the actual numbers of each species of egg in the group. We believe that this method is quite a novel one.

The plankton and hydrographic investigations relate to the year 1906. Mr. Bygrave has given the usual tables recording the distribution and relative density of the planktonic organisms present in the Channel in that year. He shows that the density of oceanic plankton may be correlated with the salinity of the water. The seasonal changes taking place in the abundance of the plankton are also discussed, and the author adopts Brandt's hypothesis, according to which the spring maximum of density of Diatom and Peridinian plankton is the result of the accumulation of food-stuffs in the water during the preceding winter months, while the summer minimum is due to the activity of denitrifying bacteria, which decompose nitrogen compounds, so that the latter cannot be used up by the diatoms.

The hydrography of the English Channel is discussed by Mr. Matthews in a short paper of great general interest. An account, illustrated by charts, of the salinity and temperature variations during the year 1906 is given, and the author then discusses the results of calculations of the mean salinities during the years 1903–9. He shows that in addition to the annual salinity variation, there is a two-yearly periodic change, of such nature that the "even" years are characterised by a high range of salinity variation, while in the "odd" years the range of variation is low. The annual and biennial periods are superposed on a longer one, probably twelve-yearly. These discussions anticipate a further paper, which promises to be one of very great interest.

J. JOHNSTONE.

A ONE-VOLUME NATURAL HISTORY.[1]

TO compress even a sketchy account of the leading types of existing animals into a small octavo volume of just over 560 pages, and that illustrated by a number of relatively large figures, is a task of stupendous difficulty. In the present instance the author has increased the difficulty by introducing—

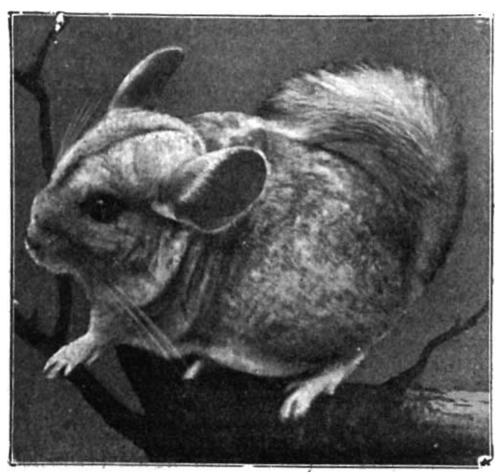

FIG. 1.—A Chinchilla. From the "New Illustrated Natural History.

probably in accordance with what I believe to be a mistaken notion on the part of publishers—a number of anecdotes, which merely waste space. This may perhaps account for the very imperfect diagnoses of most of the groups and species, which appear in many cases insufficient for their identification by those who

[1] "New Illustrated Natural History of the World." By E. Protheroe. Pp. xx+564. (London: G. Routledge and Sons, Ltd.; New York: E. P. Dutton and Co., n.d.) Price 7s. 6d. net.

are not naturalists, and for whom alone the volume is intended. As is usual in works of this nature, vertebrates claim the lion's share of the volume, the lower groups being accorded only sixty-eight pages, which is, of course, an altogether inadequate proportion of space.

Nevertheless, Mr. Protheroe has succeeded in producing a readable, and certainly a remarkably well illustrated volume, which is calculated to attract a large circle of readers. With the exception of the twenty-four coloured plates, the illustrations are from photographs, some of which are naturally better than others. In some instances the photographs, like the one of a tur (p. 169), are taken from immature specimens, which convey no idea of the adult animal. In other cases, as in the so-called Canadian skunk

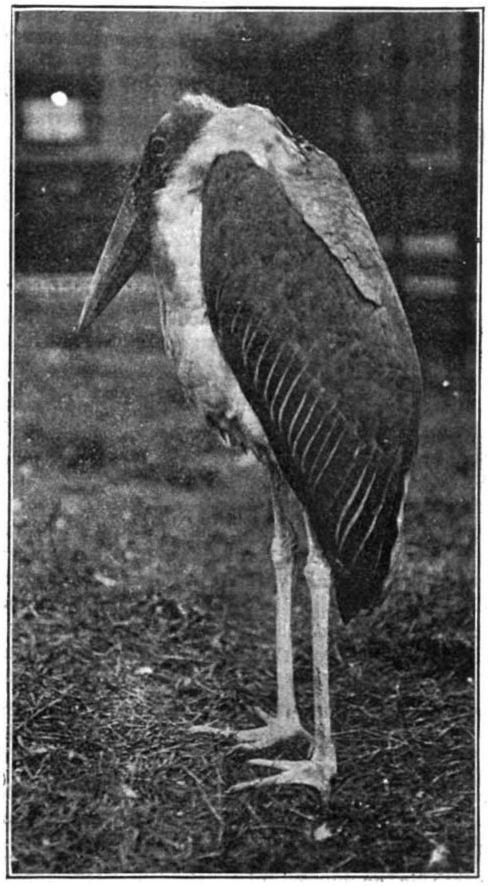

FIG. 2.—A Marabou Stork. From the "New Illustrated Natural History."

(p. 95) and dwarf buffalo (p. 162), animals are wrongly identified; while in the figure of a wild ass (p. 155) the reader is left to discover for himself whether it is intended for an Asiatic or an African species, and there is no reference in the text to the figure of an "Australian Rail" on p. 366. As regards the coloured plates, it will perhaps suffice to say that while some are excellent, the others are probably the best that could be produced for the money; but in the figure supposed to represent the black rhinoceros it seems as if the artist had made a "composite" portrait of the African and the great Indian species. Two photographs are reproduced as samples.

As regards the text, this, in addition to much more or less irrelevant matter, is marred by a large number of omissions and errors, of which only a few, and these in the sections on mammals and reptiles, can be mentioned here. In the Insectivora, for instance, no mention is made of Chrysochloridæ, Gymnurinæ, Solenodontidæ, or Potamogalidæ, while the Centetidæ are intercalated between Tupaiidæ and Macroscelididæ, and the reader is left to find out for himself the genus name of the typical representatives of the latter. Space for these omissions might have been found by cutting down the account of monkeys. Among the rodents, Pedetes is still classed with the jerboas (p. 126), and is said to be "a very similar species," while American porcupines are not separated as a family from their Old-World relatives.

Passing to ungulates, it may be noted that Grévy's zebra (p. 156) is stated to range "the Victoria Nyanza regions," whereas its habitat is east and north of that lake; and that not a word is said with regard to the range of the white rhinoceros (p. 152). On p. 169 we are informed that the Alpine ibex is "the most probable forbear of the common goat," and on p. 171 that the takin "is a native of the highest and least-known regions of Tibet." Perhaps, however, the worst misstatement in the book occurs on p. 241, where it is asserted that the opossum family is "remarkable among the marsupiated animals, because it is the only one that is not Australian." Has the author never heard of Cænolestes?

Among the reptiles it must suffice to state that there is no mention of Schlegel's gharial, that the reader is left to find out for himself what part of the globe is the home of the Chelydridæ (p. 404), and that it is scarcely true to say that the tuatera has teeth on the palate (p. 428).

Although the book has merits, I am driven to conclude from the foregoing and other instances either that the author is terribly careless, or that he is not up to his work.

R. L.

PROF. JOHANNES BOSSCHA.

THE career of this eminent physicist has not only been of importance for the advancement of physics, but also of the greatest benefit to the development of exact science in Holland. Born on November 18, 1831, at Breda, Bosscha was initiated in physics by van der Willigen, and entered the University of Leiden in 1850. His eminence as a student in different respects foreshadowed the leading position he occupied in later life. In Bosscha's later observational work the influence of the great astronomer Kaiser is evident. In March, 1852, he took his degree with a dissertation on the differential galvanometer, worked out in the Physical Laboratory at Leiden, then under the direction of Rijke. After a short stay at Berlin, he returned to this laboratory as assistant. Attention was soon directed to him by the vigorous part he took in the great scientific movement in connection with the law of conservation of energy. The most important problem dealt with in his well-known papers on the mechanical theory of electrolysis is the test of Kelvin's calculation of the electromotive force of a galvanic cell from the heat developed by the chemical processes which accompany the current. By determining in absolute measure the electromotive force of the Daniell cell, he contributed to the work which ultimately led to the adoption of the C.G.S. system of electrical units. He gave a solution of multiplex telegraphy, and several rules